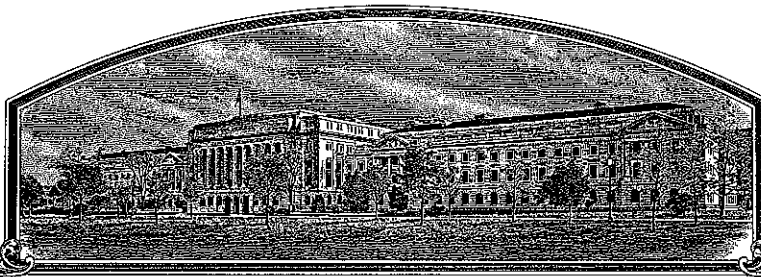


No.

200500187



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

The Regents of the University of California

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, DURUM

'Desert King'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this fifth day of July, in the year two thousand and six.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture




U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER The Regents of the University of California		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME UC1375		3. VARIETY NAME 'Desert King'	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) University of California 1111 Franklin Street, 12th Floor Oakland, California 94607-5200		5. TELEPHONE (include area code) (510) 587-6000		FOR OFFICIAL USE ONLY PVPO NUMBER 200500187 FILING DATE March 21, 2005	
		6. FAX (include area code) (510) 587-6090			
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Corporation		8. IF INCORPORATED, GIVE STATE OF INCORPORATION CA			
9. DATE OF INCORPORATION January 1, 1868		10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Michael R. Ward Morrison & Foerster LLP 425 Market Street San Francisco, Ca 94105		FILING AND EXAMINATION FEES: \$ 3652.00 DATE 3/21/2005 CERTIFICATION FEE: \$ 768.00 DATE 6/12/2006	
11. TELEPHONE (include area code) (415) 268-6237		12. FAX (include area code) (415) 268-7522		13. E-MAIL MWard@mofo.com	
14. CROP KIND (Common Name) Wheat		16. FAMILY NAME (Botanical) Poaceae		18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (OPTIONAL) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION.	
15. GENUS AND SPECIES NAME OF CROP Triticum aestivum durum		17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act) <input checked="" type="checkbox"/> YES (If "yes", answer items 21 and 22 below) <input type="checkbox"/> NO (If "no", go to item 23)			
a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$3,652), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input checked="" type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED			
23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.) *			
24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)					
25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF OWNER 		SIGNATURE OF OWNER			
NAME (Please print or type) David R. McGee		NAME (Please print or type)			
CAPACITY OR TITLE Director, Tech. Transfer		DATE 3/16/05		CAPACITY OR TITLE	
				DATE	

(See reverse for instructions and information collection burden statement)

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (in the sense that it will reproduce an entire plant) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$3,652 (\$432 filing fee and \$3,220 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office

Telephone: (301) 504-5518

FAX: (301) 504-5291

Homepage: <http://www.ams.usda.gov/science/pvpo/pvpindex.htm>

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 <http://www.ams.usda.gov/lsg/seed.htm>.

ITEM

- 19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) evidence of uniformity and stability; and (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
 - (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
 - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
20. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See Regulations and Rules of Practice, Section 97.103).
23. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
24. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

22. CONTINUED FROM FRONT (Please provide a statement as to the limitation and sequence of generations that may be certified.)

23. CONTINUED FROM FRONT (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

24. CONTINUED FROM FRONT (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, sexual orientation, marital or family status, political beliefs, parental status, or protected genetic information. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

ADDENDUM TO ST-470: Item No. 22.

Foundation seed will not be limited to the number of generations. Foundation seed will be maintained solely by the University of California Foundation Seed Program. Registered seed will only be produced from Foundation seed.

"Desert King"

Exhibit A: Origin (Parentage) and Breeding History

1) Parentage: Selection of line Inter_18 = Lava_2//2*(Huitle/Yavaros).

Please see **Appendix A** for pedigree of Desert King. Yavaros (PI 520208) is a cultivar Developed by the University of California in 1979. Lavandera_2 (GID 134002) and Huitle (GID 18557) were lines developed by CIMMYT. These lines are publicly available.

2) Breeding History

A) Stages of selection and multiplication

- The original material was received in August 1997 from CIMMYT as sister lines INTER_11 and INTER_18 from the cross CD96235 (29th IDSN).
- Seeds were planted under quarantine in the greenhouse in 1997 (Exp. 97110).
- Seed harvested from Exp. 97110 was used to set up Exp. 98070, which was planted at Tulelake, California.
- Segregation for height and heading time was observed so different plants were selected for further selection and purification.
- In 1999 Exp. 99206, four heads were selected, and planted as headrows in 2000.
- Only one headrow (00220/303) was selected based on height, heading time, and uniformity.
- Two similar plants were selected from this headrow and planted as multiple rows at Tulelake (Exp 01220/71 and 72).
- No differences were observed between 01220/71 and 01220/72 so seeds were planted at UC Davis, California in November 2001 for seed increase.
- One thousand heads were selected from this increase to produce Breeder Seed during the 2002-2003 growing season at UC Davis.
- Foundation Seed was produced during the 2003-2004 growing season at Imperial Valley, California and Registered Seed increases were planted in November 2004.

"Desert King"

B) Selection criteria

The plants were selected based on observation of the plants in the field, and objective yield and laboratory data. Elite Durum yield trials were performed at two locations and Regional Trials were performed at five locations during 2002 and 2003. Quality data was obtained from the California Wheat Commission Quality Laboratory for both years for three locations. The following criteria were used:

1. Early flowering
2. Low stature and good agronomic appearance
3. High yield potential
4. High protein content
5. High content of yellow pigments
6. Disease resistance, particularly to stripe rust and leaf rust
7. Strong gluten

C) Characteristics by which the application variety can be distinguished from the direct parents:

Although a direct comparison with the parents was not performed, criteria listed above were used to select 'Desert King'.

D) Statement concerning whether the variety is uniform and stable and how many generations the variety has been observed to determine this.

- Variety Desert King is uniform for all traits as described in Exhibit C. (Objective Description of Variety)
- Variety Desert King has been reproduced and judged stable for the past three generations.
- Variety Desert King was stable in all generations of Advanced, Elite and regional field testing as well as during the production of Breeder's seed and Foundation seed

E) Statement concerning whether there are genetic variants that are to be expected during normal maintenance of the variety, the description of the variants, and their frequency.

There are two variants of Low Molecular Weight (LMW) glutenins that do not affect the descriptive characteristics of the variety. Figure 1 shows the two patterns of LMW Glutenins in SDS-PAGE.

"Desert King"

Plants that are up to 1 head taller than the average Desert King plants had been observed with a frequency of 3 in 1000 plants in the Breeders' and Foundation Seed and are part of the genetic variability included within the description of this variety.

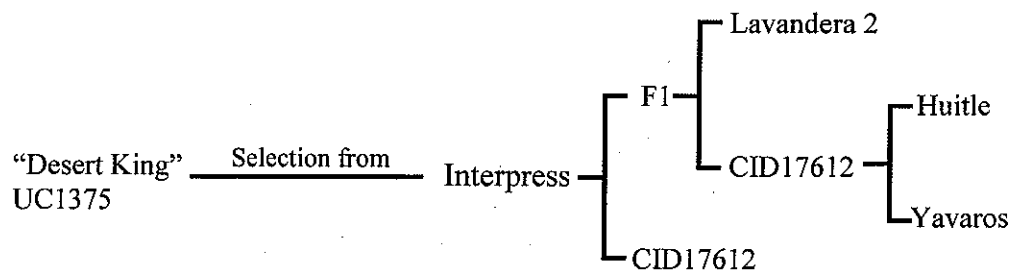
Appendix A – Pedigree for Desert King

Exhibit B: Statement of Distinctiveness

The variety most similar to 'Desert King' is the widely grown variety 'Kronos'. "Desert King" is a durum spring wheat. It is a short-stature variety of similar height as Kronos and Kofa with a mid-season heading time (10 days later than Kronos in Imperial Valley and San Joaquin Valley). It has characteristic erect leaves and a purple color in the auricles region. Desert King has a straight peduncle, and dense spikes, with long awns that turn black at maturity. Glumes are large (>0.4 mm wide x > 0.9 mm long), white, glabrous with wanting shoulders with short awns. It has better resistance to lodging and higher yield potential than the dominant cultivar Kronos. During 2002 and 2003 Desert King yields were 600 lb./acre higher than Kronos in the Imperial Valley and 1,170 lbs./acre higher than Kronos in the San Joaquin Valley. Desert King has a broad adaptation to California environments and adequate levels of resistance to leaf rust, stripe rust and Septoria tritici blotch. Its bushel weight, grain protein content, W alveograph values, firmness, and pasta color are not significantly different from Kronos, as shown in Table A.

Table A. Statistical analysis of differences in semolina and pasta color

Experiment	Semolina b value		Pasta b value		Pasta Color Score	
	Kronos	Desert King	Kronos	Desert King	Kronos	Desert King
Regional 02 – Imperial	28.1	25.3	42.6	42.0	9.0	9.5
Regional 02 – Kings	25.2	25.4	43.5	42.0	10.0	9.5
Elite 02 – Davis	25.6	23.5	40.7	39.4	8.5	8.5
Elite 02 - Imperial	24.6	24.7	41.7	39.4	9.0	8.5
Elite 02 – Kings	24.0	23.4	41.0	40.8	9.0	9.0
Regional 01 Imperial	27.9	26.0	40.5	42.0	9.0	9.0
Averages	25.9	24.7	41.7	40.9	9.1	9.0
Paired t-test P value	P=0.07 NS		P=0.23 NS		P=0.61 NS	
Shapiro-Wilk Normality	P=0.13 NS		P=0.99 NS		P=0.59 NS	
Levene Homogeneity Var	P=0.11 NS		P=0.75 NS		P=0.82 NS	

Measurements of semolina color are based on the Minolta Chromameter "b" values performed at the California Wheat Commission Quality Laboratory. The pasta color score presented herein is a color index integrating the two values in a scale 1 to 10 with 10 equal the best color. Samples are from six different trials at three locations (2001 and 2002), and the statistical analysis was performed as a paired t-test to eliminate the effect of location. Only one quality test was performed per location. Probability values are provided below the means. None of the tests in Table A showed significant values supporting the statement of no significant differences in color between the two varieties. All three test show normality of residuals by Shapiro-Wilk test and homogeneity of variances by Levene Test (last two rows Table A) confirming assumptions of the ANOVA.

'Desert King' has auricles that turn purple after anthesis and awns that turn black at maturity. In the varieties 'Kronos' and 'Kofa' the leaf auricles remain green after

"Desert King"

anthesis and the awns remain white or yellow after maturity. Due to the dramatic differences these color references are exempt of requiring a standard such as the Royal Horticultural Society Colour Chart.

This variety has a better semolina yield than the dominant cultivar Kronos ($P=0.01$).

The breeders' seed of 'Desert King' is heterogeneous for two patterns of Low Molecular Weight Glutenins as shown in Figure 1.

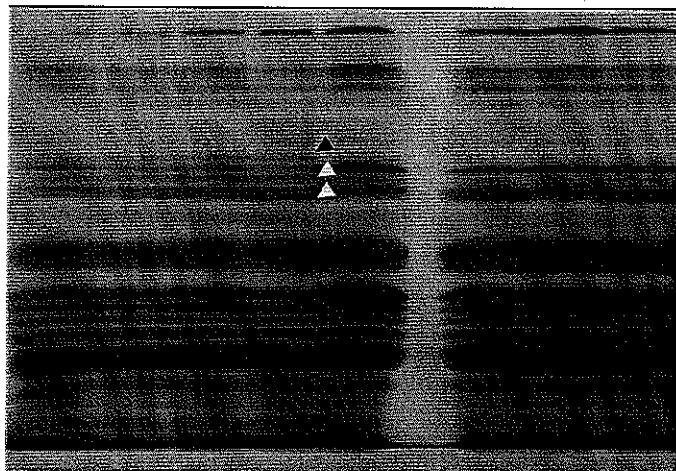


Figure 1.

Total protein analysis by SDS-PAGE of seeds from different heads of 'Desert King' Breeders' seed. Upper bands correspond to high molecular weight (HMW) glutenins and the lower bands to the low molecular weight (LMW) glutenins. The segregating bands are indicated by an arrow.

REPRODUCE LOCALLY. Include form number and date on all reproductions.

instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLAND VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* supp.)

NAME OF APPLICANT(S)	FOR OFFICIAL USE ONLY
The Regents of the University of California	PVPO NUMBER 200500187
ADDRESS (Street and No. or RD No., City, State, and Zip Code) University of California 1111 Franklin Street, 12 th Floor Oakland CA 94607-5200	VARETY NAME 'Desert King'
	TEMPORARY OR EXPERIMENTAL DESIGNATION UC1375

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. or) when number is either 99 or less or 9 less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: NA
Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

- 1=Common
2=Durum
3=Club
4=Other (SPECIFY): _____

2. VERNALIZATION:

- 1=Spring
2=Winter
3=Other (SPECIFY): _____

3. COLEOPTILE ANTHOCYANIN:

- 1=Absent 2=Present

4. JUVENILE PLANT GROWTH:

- 1=Prostrate 2=Semi-erect 3=Erect

5. PLANT COLOR (boot stage):

- 1=Yellow-Green
2=Green
3=Blue-Green

6. FLAG LEAF (boot stage):

- 1=Erect
2=Recurved

 1=Not Twisted
2=Twisted

 1=Wax Absent
2=Wax Present

7. EAR EMERGENCE:

- Number of Days (Average)
 Number of Days Later Than Kronos at Davis, California *
Same as _____ *
 Number of Days Later Than Kronos at Imperial Valley, California *

* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

8. ANTHOR COLOR:

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- ☒ 1=Yellow
☐ 2=Purple

9. PLANT HEIGHT (from soil to top of head, excluding awns):

☒ ☒ ☒ cm (Average)☐ ☐ cm Taller Than _____ *Same as Kronos at Imperial *☒ ☒ cm Shorter Than Kronos at Kings and Kern *

10. STEM

A. ANTHOCYANIN

- ☒ 1=Absent
☐ 2=Present

B. WAXY BLOOM

- ☒ 1=Absent
☐ 2=Present

C. HAIRINESS

(last internode of rachis)

- ☒ 1=Absent
☐ 2=Present

D. INTERNODE

- ☒ 1=Hollow 2=Semi-solid 3=Solid
☒ 5 Number of Nodes

E. PEDUNCLE

- ☒ 1=Erect 2=Recurved 3=Semi-erect
☒ ☒ 6 cm Length

F. AURICLE

- ☒ 2 Anthocyanin 1=Absent 2=Present
☒ 2 Hair 1=Absent 2=Present

11. HEAD (at Maturity):

A. DENSITY

- ☒ 1=Lax
☐ 2=Middense (Laxidense)
☐ 3=Dense

B. SHAPE

- ☒ 1=Tapering
☐ 2=Strap
☐ 3=Clavate
☐ 4=Other (SPECIFY): _____

C. CURVATURE

- ☒ 1=Erect
☐ 2=Inclined
☐ 3=Recurved

D. AWNEDNESS

- ☒ 1=Awnless
☐ 2=Apically Awnletted
☐ 3=Awnletted
☐ 4=Awned

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12. GLUMES (at Maturity):

A. COLOR

- 1** 1=White
2=Tan
3=Other (SPECIFY): _____

B. SHOULDER

- 1** 1=Wanting 2=Oblique
3=Rounded 4=Square
5=Elevated 6=Apiculate
7=Other (SPECIFY): _____

C. SHOULDER WIDTH

- 1** 1=Narrow
2=Medium
3=Wide

D. BEAK

- 3** 1=Obtuse
2=Acute
3=Acuminate

E. BEAK WIDTH

- 1** 1=Narrow
2=Medium
3=Wide

F. GLUME LENGTH

- 3** 1=Short (ca. 7mm)
2=Medium (ca. 8mm)
3=Long (ca. 9mm)

G. WIDTH

- 3** 1=Narrow (ca. 3mm)
2=Medium (ca. 3.5mm)
3=Wide (ca. 4mm)

13. SEED

A. SHAPE

- 1** 1=Ovate
2=Oval
3=Elliptical

B. CHEEK

- 1** 1=Rounded
2=Angular

C. BRUSH

- 3** 1=Short 1=Not Collared
2=Medium 2=Collared
3=Long

D. CREASE

- 3** 1=Width 60% or less of Kernel
2=Width 80% or less of Kernel
3=Width Nearly as Wide as Kernel

- 2** 1=Depth 20% or less of Kernel
2=Depth 35% or less of Kernel
3=Depth 50% or less of Kernel

E. COLOR

- 2** 1=White
2=Amber
3=Red
4=Other (SPECIFY): _____

F. TEXTURE

- 1** 1=Hard
2=Soft
3=Other (SPECIFY): _____

G. PHENOL REACTION (See instructions):

- 1** 1=Ivory 4=Dark Brown
2=Fawn 5=Black
3=Light Brown Standard Durum color

H. SEED WEIGHT

- 4 9** g/1000 seed (Whole number only)

I. GERM SIZE

- 3** 1=Small
2=Midsize
3=Large

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

- | | |
|--|---|
| <input type="checkbox"/> Stern Rust (<i>Puccinia Graminis</i> f. sp. <i>tritici</i>) | <input type="checkbox"/> Leaf Rust (<i>Puccinia recondita</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> Stripe Rust (<i>Puccinia striiformis</i>) | <input type="checkbox"/> Loose Smut (<i>Ustilago tritici</i>) |
| <input type="checkbox"/> Tan Spot (<i>Pyrenophora tritici-repentis</i>) | <input type="checkbox"/> Flag Smut (<i>Urocystis agropyri</i>) |
| <input type="checkbox"/> Halo Spot (<i>Selenophoma donacis</i>) | <input type="checkbox"/> Common Bunt (<i>Tilletia tritici</i> or <i>T. laevis</i>) |
| <input type="checkbox"/> <i>Septoria nodorum</i> (Glume Blotch) | <input type="checkbox"/> Dwarf Bunt (<i>Tilletia controversa</i>) |
| <input type="checkbox"/> <i>Septoria avenae</i> (Speckled Leaf Disease) | <input type="checkbox"/> Karnal Bunt (<i>Tilletia indica</i>) |
| <input type="checkbox"/> <i>Septoria tritici</i> (Speckled Leaf Blotch) | <input type="checkbox"/> Powdery Mildew (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> Scab (<i>Fusarium</i> spp.) | <input type="checkbox"/> "Snow Molds" |
| <input type="checkbox"/> "Black Point" (Kernel Smudge) | <input type="checkbox"/> Common Root Rot (<i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> Barley Yellow Dwarf Virus (BYDV) | <input type="checkbox"/> Rhizoctonia Root Rot (<i>Rhizoctonia solani</i>) |
| <input type="checkbox"/> Soilborne Mosaic Virus (SBMV) | <input type="checkbox"/> Black Chaff (<i>Xanthomonas campestris</i> pv. <i>translucens</i>) |
| <input type="checkbox"/> Wheat Yellow (Spindle Streak) Mosaic Virus | <input type="checkbox"/> Bacterial Leaf Blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>) |
| <input type="checkbox"/> Wheat Streak Mosaic Virus (WSMV) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Other (SPECIFY) _____ | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Other (SPECIFY) _____ | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Other (SPECIFY) _____ | <input type="checkbox"/> Other (SPECIFY) _____ |

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)







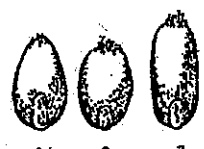
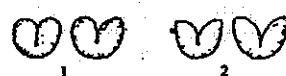
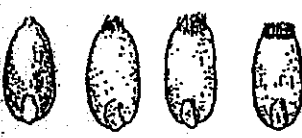
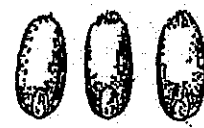
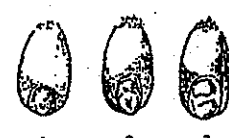
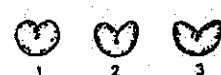
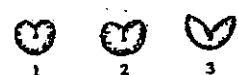
PLEASE SPECIFY BIOTYPE (where needed)

- | | |
|--|--|
| <input type="checkbox"/> Hessian Fly (<i>Mayetiola destructor</i>) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Stem Sawfly (<i>Cephus</i> spp.) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Cereal Leaf Beetle (<i>Oulema malanopa</i>) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Russian Aphid (<i>Diuraphis noxia</i>) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Greenbug (<i>Schizaphis graminum</i>) | <input type="checkbox"/> Other (SPECIFY) _____ |
| <input type="checkbox"/> Aphids | <input type="checkbox"/> Other (SPECIFY) _____ |

WHEAT DESCRIPTOR ILLUSTRATIONS

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Section numbers correspond to the numbers of the sections on the form.

4 EARLY PLANT GROWTH HABIT:  1 Prostrate 2 Intermediate 3 Erect	10 STEM INTERNODE X-SECTION  1 Hollow 2 Semi-Solid 3 Solid	11 SPIKE SHAPE  1 Tapering 2 Oblong 3 Clavate 4 Elliptical	
11 AWNEDNESS:  1 Awnless 2 Apically Awnleted 3 Awnleted 4 Awned	12 BEAK SHAPE:  1 Obtuse 2 Acute 3 Acuminate		
	12 SHOULDER SHAPE:  1 Wanting 2 Oblique 3 Rounded 4 Square 5 Elevated 6 Apiculate		
13 SEED SHAPE:  1 Ovate 2 Oval 3 Elliptical	13 CHEEK SHAPE:  1 Rounded 2 Angular	13 BRUSH SIZE:  1 Small 2 Mid-sized 3 Large 4 Collared	13 BRUSH HAIR LENGTH:  1 Short 2 Medium 3 Long
GERM (EMBRYO) SIZE:  1 Small 2 Mid-sized 3 Large	13 SEED CREASE WIDTH:  1 Narrow 2 Mid-Wide 3 Wide	13 SEED CREASE DEPTH:  1 Shallow 2 Mid-Deep 3 Deep	

REFERENCE

Briggle, L.W. and L.P. Reitz. 1963. Classification of Triticum Species and of Wheat Varieties Grown in the United States. Technical Bulletin 1278. United States Department of Agriculture.

"Desert King"

Exhibit D: Additional Description of the Variety**1) STATISTICAL COMPARISON WITH OTHER CALIFORNIA VARIETIES**

The description of Desert King presented below is based on data obtained in part from the Elite trials performed by the UCD breeding program and the Agronomy Progress Reports, University of California, Davis (L. Jackson et al. 2002, 2003. "Regional barley, common and durum wheat, triticale, and oat performance tests" in California, Agronomy Progress Report, UC Davis).

For statistical analysis Year/Location combinations were used as blocks and the Year/Location * Variety interaction was used as an estimate of the error term. Desert King was compared with Kronos which is the leading variety in the durum growing area in California. The California Wheat Commission Quality Laboratory, Woodland, CA, provided breadmaking quality analyses.

In summary, Desert King represents a significant yield increase over the current dominant variety Kronos in both the San Joaquin and Imperial Valley regions that will benefit the CA wheat growers. Desert King maintains the high quality standard required for the Dessert Durum class.

A) AGRONOMIC CHARACTERISTICS

a) Height. The mean height of Desert King is 86 cm when grown under irrigation in the Imperial Valley and 100 cm when grown in the San Joaquin Valley. Desert King and Kronos are not significantly different in height (Table 1).

Table 1. Height in cm in Imperial Valley and San Joaquin Valley

Location	Kronos	Desert King	P
Imp. 03 Elite	86.4	88.9	
Imp. 02 Regional	86.4	86.4	
Imp. 03 Regional	83.9	83.9	
Average	85.6	86.4	0.42 NS
King 02 Elite	111.8	109.2	
King 03 Elite	104.1	93.8	
King 02 Regional	111.8	109.2	

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King 03 Regional	106.7	93.9	
Kern 02 Regional	99.1	99.1	
Kern 03 Regional	91.4	88.9	
Average	104.2	99.0	0.06 NS

b) Heading date. Heading time of Desert King in the Imperial Valley is midseason, heading approximately 6 days later than Kronos and reaching maturity approximately 3 days later than Kronos (Table 2). Initial data showed that these differences were not significant but the P values were close to the significance levels ($P=0.06$)

Table 2. Heading and Maturity in days after January 1st in Imperial Valley and San Joaquin Valley

Location	Kronos		Desert King		P	
	Head	Mat	Head	Mat	Head	Mat
Imp. 02 Elite	79	126	84	130		
Imp. 03 Elite	90	147	100	152		
Imp. 02 Regional	83	132	84	132		
Imp. 03 Regional	90	146	100	150		
Average	86	138	92	141	0.06	0.06

Statistical differences in Heading and Maturity

In Table 2 above including data only from 2002-2003, the differences in heading date and maturity between Kronos and Desert King were close to significance levels ($P=0.06$). The addition of experiments from 2004 and 2005 confirmed that differences in heading date and maturity for these two varieties are significant. Both heading and maturity are measured as before as days after January 1st at Imperial Valley.

Differences in heading time: Five out of the six individual experiments showed significantly later heading of Desert King relative to Kronos (Table 3). The complete ANOVA analysis using environment as a random variable and blocks nested within location showed a significantly later heading in Desert King (average 91.3 ± 1.7) relative to Kronos (average 84.0 ± 1.6). On average Desert King headed 7 days later than Kronos.

This represents a difference in heading time of 8% relative to Kronos. In this complete model analysis, the environment * variety interaction was used as an error term to test the significance of the differences between varieties. Even with

this stringent criteria heading dates of Desert King were significantly later than those of Kronos ($P < 0.0062$, P Levene's test = 0.55, P Shapiro-Wilk test = 0.15). This analysis included 4 experiments from the Regional Trials (Imperial 02-05) and two Elite trials (Imperial 02-03) for which individual values for the four blocks were available.

Table 3. Heading Time. ANOVAS for six different experiments at Imperial Valley (Elite trials 2002-2003 and Regional trials 2002-2005). Significantly later flowering dates of Desert King (DK) relative to Kronos were detected in 5 out of the 6 individual experiments. Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality (all non-significant)

Year	Experiment	Rep	Kronos	DK	P ANOVA	Levene	Normality
2002	Imp. Regional	1	81	84			
2002	Imp. Regional	2	84	84			
2002	Imp. Regional	3	84	84			
2002	Imp. Regional	4	84	84			
2002	Imp. Regional	Mean =	83.3	84.0	P ANOVA	Levene	Normality
2002	Imp. Regional	SE =	0.8	0.0	0.39	0.18	0.52
2003	Imp. Regional	1	92	99			
2003	Imp. Regional	2	89	101			
2003	Imp. Regional	3	89	99			
2003	Imp. Regional	4	89	99			
2003	Imp. Regional	Mean =	89.8	99.5	P ANOVA	Levene	Normality
2003	Imp. Regional	SE =	0.8	0.5	0.0025	0.48	0.51
2004	Imp. Regional	1	92	97			
2004	Imp. Regional	2	92	100			
2004	Imp. Regional	3	92	99			
2003	Imp. Regional	4	92	99			
2004	Imp. Regional	Mean =	92.0	98.8	P ANOVA	Levene	Normality
2004	Imp. Regional	SE =	0.0	0.6	0.0017	0.15	0.84
2005	Imp. Regional	1	70	82			
2005	Imp. Regional	2	70	82			
2005	Imp. Regional	3	71	81			
2004	Imp. Regional	4	71	82			
2005	Imp. Regional	Mean =	70.5	81.8	P ANOVA	Levene	Normality
2005	Imp. Regional	SE =	0.3	0.3	0.0002	0.64	0.65
2002	Imp. Elite	1	78	85			
2002	Imp. Elite	2	80	83			
2002	Imp. Elite	3	79	84			
2002	Imp. Elite	4	79	84			
2002	Imp. Elite	Mean =	79.0	84.0	P ANOVA	Levene	Normality
2002	Imp. Elite	SE =	0.4	0.4	0.008	1.00	0.51
2003	Imp. Elite	1	89	101			
2003	Imp. Elite	2	89	99			
2003	Imp. Elite	3	92	99			
2003	Imp. Elite	4	89	99			
2003	Imp. Elite	Mean =	89.8	99.5	P ANOVA	Levene	Normality

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"Desert King"

2003	Imp. Elite	SE =	0.8	0.5	0.0025	0.48	0.51
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Differences in maturity: Four out of the six individual experiments in Imperial Valley showed significantly later maturity dates of Desert King relative to Kronos (Table 4).

The overall analysis using environment as a random variable and blocks nested within location showed a significantly later maturity in Desert King (average 139.8 ± 1.8) relative to Kronos (average 135.7 ± 1.8). On average Desert King matured 4 days later than Kronos.

This represents a difference in maturity time of 3% relative to Kronos. In this complete model analysis, the environment * variety interaction was used as an error term to test the significance of the differences between varieties. Even with this stringent criteria maturity date of Desert King was significantly later than in Kronos ($P < 0.008$, P Levene's test = 0.70, P Shapiro-Wilk test = 0.29). This analysis included 4 experiments from the Regional Trials (Imperial 02-05) and two Elite trials (Imperial 02-03) for which individual values for the four blocks were available.

Table 4. Maturity. ANOVAS for six different experiments at Imperial Valley (Elite trials 2002-2003 and Regional trials 2002-2005). Significantly later flowering dates of Desert King (DK) relative to Kronos were detected in 5 out of the 6 individual experiments. Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality (all non-significant)

Year	Experiment	Rep	Kronos	DK	P ANOVA	Levene	Normality
2002	Imp. Regional	1	130	130			
2002	Imp. Regional	2	133	130			
2002	Imp. Regional	3	130	133			
2002	Imp. Regional	4	133	133			
2002	Imp. Regional	Mean =	131.5	131.5	P ANOVA	Levene	Normality
2002	Imp. Regional	SE =	0.9	0.9	1.00	0.71	0.87
2003	Imp. Regional	1	148	148			
2003	Imp. Regional	2	145	152			
2003	Imp. Regional	3	145	148			
2003	Imp. Regional	4	145	152			
2003	Imp. Regional	Mean =	145.8	150.0	P ANOVA	Levene	Normality
2003	Imp. Regional	SE =	0.8	1.2	0.088	0.09	0.41
2004	Imp. Regional	1	137	142			
2004	Imp. Regional	2	137	142			
2004	Imp. Regional	3	136	143			
2003	Imp. Regional	4	137	142			
2004	Imp. Regional	Mean =	136.8	142.3	P ANOVA	Levene	Normality
2004	Imp. Regional	SE =	0.3	0.3	0.0016	1.00	0.52
2005	Imp. Regional	1	128	133			
2005	Imp. Regional	2	126	135			
2005	Imp. Regional	3	127	134			
2004	Imp. Regional	4	127	134			
2005	Imp. Regional	Mean =	127.0	134.0	P ANOVA	Levene	Normality
2005	Imp. Regional	SE =	0.4	0.4	0.0033	1.00	0.09
2002	Imp. Elite	1	127	128			
2002	Imp. Elite	2	125	130			
2002	Imp. Elite	3	126	130			
2002	Imp. Elite	4	126	130			
2002	Imp. Elite	Mean =	126.0	129.5	P ANOVA	Levene	Normality
2002	Imp. Elite	SE =	0.4	0.5	0.0273	0.68	0.97
2003	Imp. Elite	1	145	152			
2003	Imp. Elite	2	148	152			
2003	Imp. Elite	3	148	150			
2003	Imp. Elite	4	148	152			
2003	Imp. Elite	Mean =	147.3	151.5	P ANOVA	Levene	Normality
2003	Imp. Elite	SE =	0.8	0.5	0.0259	0.48	0.51

c) Straw strength.

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Desert King has excellent lodging resistance, superior to Kronos in all locations (Table 5).

Table 5. b scores. Scale: 1= 0-3%, 2= 4-14%, 3=15-29%, 4= 30-49%.

Location	Kronos	Desert King	P
Imp. 03 Elite	4.5	3.3	
Imp. 02 Regional	5.8	3.0	
Imp. 03 Regional	4.5	2.3	
King 02 Elite	5.8	1.0	
King 03 Elite	3.3	1.0	
King 02 Regional	5.5	2.0	
King 03 Regional	4.5	1.0	
Kern 02 Regional	6.3	2.0	
Kern 03 Regional	8.0	6.0	
Average	5.4	2.4	<0.0001

* Means with the same letter are not significantly different. Shattering and lodging: 1=0-3%, 2=4-14%, 3=15-29%, 4=30-49%, 5=50-69%, 6=70-84%, 7=85-95%, 8=96-100%.

Statistical differences in lodging

Table 6. Lodging score* for individual replications from five locations. Tests were organized in Randomized Complete Block designs with four replications (plot sizes 20 x 5 feet). Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality. DK= Desert King.

Year	Location	Rep	Kronos	DK	P ANOVA	Levene	Normality
2002	Kern	1	6	1			
2002	Kern	2	7	2			
2002	Kern	3	6	2			
2002	Kern	4	6	3			
2002	Kern	Mean =	6.3	2.0	P ANOVA	Levene	Normality
2002	Kern	SE =	0.3	0.4	0.003	0.36	0.65
2002	Imperial	1	6	3			
2002	Imperial	2	6	2			
2002	Imperial	3	5	4			
2002	Imperial	4	6	3			
2002	Imperial	Mean =	5.8	3.0	P ANOVA	Levene	Normality
2002	Imperial	SE =	0.3	0.4	0.022	0.36	0.84
2003	Imperial	1	5	3			

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2003	Imperial	2	5	2			
2003	Imperial	3	4	2			
2003	Imperial	4	4	2			
2003	Imperial	Mean =	4.5	2.3	P ANOVA	Levene	Normality
2003	Imperial	SE =	0.3	0.3	0.003	0.63	0.52
2004	Kings	1	8	2			
2004	Kings	2	7	1			
2004	Kings	3	8	7			
2004	Kings	4	7	1			
2004	Kings	Mean =	7.5	2.8	P ANOVA	Levene	Normality
2004	Kings	SE =	0.3	1.4	0.03	0.19	0.52
2005	Kings	1	7	3			
2005	Kings	2	8	2			
2005	Kings	3	8	3			
2005	Kings	4	8	7			
2005	Kings	Mean =	7.8	3.8	P ANOVA	Levene	Normality
2005	Kings	SE =	0.3	1.1	0.03	0.19	0.98

* Rating scale for lodging (% of the plot lodged): 1= 0- 3%, 2= 4-14%, 3= 15-29%, 4= 30-49%, 5=50-69%, 6=70-84%, 7= 85-95%, 8=96-100%

The ANOVA using the complete model considering environment as a random variable and blocks nested within location, showed a significant decrease in lodging in Desert King (average score 2.7= less than 15% lodging) relative to Kronos (average score 5.5 = 50-70% lodging). This analysis included 13 environments from the Regional Trials for which individual values for the four blocks were available (Imperial 02-05, Kern 02-05, Kings 02-05, and Fresno 05). This represents an improvement of more than 35% in lodging resistance. In this complete model analysis, the environment * variety interaction was used as an error term to test the significance of the differences between varieties. Even with this stringent criteria the lodging scores of Desert King were significantly lower than those of Kronos ($P < 0.0001$, P Levene's test= 0.73, P Shapiro-Wilk test= 0.27).

d) Grain yield. Desert King has been evaluated in irrigated production in the Imperial Valley and the San Joaquin Valley, where durum wheats are grown commercially. Desert King was the highest yielding variety in Regional trials in Imperial Valley 2003, King 2002 and King 2003, and second highest in Madera 2003. It was also the highest yielding variety in Davis Regional trials in 2002 and fourth highest in 2003, demonstrating the wide adaptability of this variety. On average "Desert King" yields were 600 lbs./acre higher than Kronos in the Imperial Valley and 1,170 lbs./acre higher than Kronos in the San Joaquin Valley.

Table 7. Mean grain yield in lbs./acre from Regional Performance Tests (2002-2003) grouped by production areas.

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Location	Kronos	Desert King P	
Imp. 02 Elite	6540	7290	
Imp. 03 Elite	7540	7990	
Imp. 02 Regional	7470	7780	
Imp. 03 Regional	7050	8070	
Average	7150	7783	P= 0.03*
King 02 Elite	7650	8370	
King 03 Elite	7120	8530	
King 02 Regional	6900	8740	
King 03 Regional	7270	8680	
Kern 02 Regional	6140	7280	
Kern 03 Regional	4060	5700	
Madera 02 Regional	4700	4560	
Madera 03 Regional	5020	6410	
Average	6108	7284	P=0.001**

Supportive data/statistics for yield claims:

We include below the statistical analysis for seven independent year/location analysis tested separately to support our claim of a quantitative difference in yield between Kronos and Desert King (Table 8). All these tests were part of Regional Testing trials. All tests were organized in Randomized Complete Block designs with four replications (plot sizes 20 x 5 feet). Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality. Detailed descriptions of planting dates, harvesting, and cultivation conditions can be found at (<http://agric.ucdavis.edu/crops/cereals/cereal.htm>).

The ANOVA analysis using the complete model and including all 15 environments from the Regional Testing trials (Imperial 02-05, Kern 02-05, Kings 02-05, Madera 02-03, and Fresno 05) for which data was available for each of the four individual blocks also showed a significantly higher yield in Desert King relative to Kronos ($P < 0.0001$). In this analysis the environments (year/location) were considered as random variables, blocks were nested within location, and the environment * variety interaction was used as an error term. This interaction error term is usually larger than intra-experiment error term and therefore this is a more stringent test of significance. The significant P value in this analysis ($P < 0.0001$) indicated that the differences in yield between Kronos and Desert King were

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significantly larger than the variability of the trait across environments. The average yield of Desert King (5200 ± 164 lb/a) was almost 1000 lb/a higher than the average yield of Kronos (4260 ± 177 lb/a). The average yield of Desert King from these 15 environments was 22% higher than the average yield from Kronos.

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Table 8 Test of seven ANOVAS for seven different year/locations showing significantly higher yields of Desert King (DK) relative to Kronos. Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality (all non-significant)

Year	Location	Rep	Kronos	DK	P ANOVA	Levene	Normality
2003	Kern	1	2510	4140			
2003	Kern	2	3440	3920			
2003	Kern	3	2820	4700			
2003	Kern	4	2930	4200			
2003	Kern	Mean =	2925	4240	P ANOVA	Levene	Normality
2003	Kern	SE =	193	165	0.023	0.72	0.98
2003	Kings	1	5920	6590			
2003	Kings	2	5340	7140			
2003	Kings	3	4820	6050			
2003	Kings	4	4920	6720			
2003	Kings	Mean =	5250	6625	P ANOVA	Levene	Normality
2003	Kings	SE =	250	225	0.015	0.79	0.63
2003	Imperial	1	5887	6718			
2003	Imperial	2	5673	6211			
2003	Imperial	3	6083	6743			
2003	Imperial	4	5861	7218			
2003	Imperial	Mean =	5876	6723	P ANOVA	Levene	Normality
2003	Imperial	SE =	84	206	0.018	0.20	0.99
2004	Kern	1	4860	5310			
2004	Kern	2	5030	5790			
2004	Kern	3	4740	5980			
2004	Kern	4	3740	5130			
2004	Kern	Mean =	4593	5553	P ANOVA	Levene	Normality
2004	Kern	SE =	290	199	0.021	0.45	0.32
2004	Kings	1	2070	5870			
2004	Kings	2	3080	6190			
2004	Kings	3	2700	3100			
2004	Kings	4	3040	5650			
2004	Kings	Mean =	2723	5203	P ANOVA	Levene	Normality
2004	Kings	SE =	234	710	0.04	0.22	0.99
2005	Kern	1	2470	3610			
2005	Kern	2	3080	3690			
2005	Kern	3	3040	3320			
2005	Kern	4	2370	3140			
2005	Kern	Mean =	2740	3440	P ANOVA	Levene	Normality
2005	Kern	SE =	186	128	0.03	0.05	0.40
2005	Kings	1	2680	5880			
2005	Kings	2	3520	5520			
2005	Kings	3	4160	5070			
2005	Kings	4	3620	5070			
2005	Kings	Mean =	3495	5385	P ANOVA	Levene	Normality
2005	Kings	SE =	306	196	0.03	0.37	0.94

e) **Validity of statistics** Assumptions of the ANOVA included in Tables 1, 2, 3, and 7 above were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality of residuals. All statistical analysis were performed using SAS 9.1. Results are shown in Table 9.

Table 9. Test of ANOVA assumptions in Tables presented.

Table	Trait	Normality	Homogeneity of variances
1	Height Imperial Valley	0.46 NS	0.27 NS
	Height San Joaquin Valley	0.45 NS	0.79 NS
2	Heading date	0.47 NS	0.41 NS
	Maturity date	0.98 NS	0.45 NS
5	Straw strength	0.09 NS	0.66 NS
7	Yield Imperial Valley	0.55 NS	0.50 NS
	Yield San Joaquin Valley	0.94 NS	0.53 NS

B) DISEASE REACTIONS

In the field tests done during 2002 and 2003 in Davis, Kings, Kern, and Madera and Imperial Valley, Desert King was resistant to black point, leaf rust, stripe rust and Barley Yellow dwarf virus.

Table 10. Black Point, Leaf Rust, Stripe Rust, and Barley Yellow Dwarf Virus scores from Regional Performance Tests 2002-2003. Rating scale for diseases (area of flag-1 leaf affected at soft dough stage): 1= 0-3%, 2= 4-14%, 3=15-29%, 4= 30-49%, 5= 50-69%, 6=70-84%, 7=85-95%, 8=96-100%.

Location	Black Point Kronos DK		Leaf Rust Kronos DK		Stripe Rust Kronos DK		BYDV Kronos DK	
Imperial 02 Regional	-	-	-	-	-	-	1.0	1.0
Imperial 03 Regional	-	-	-	-	-	-	1.5	1.0
Davis 02 Regional	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0
Davis 03 Regional	1.5	1.0	-	-	3.8	1.3	-	-
King 02 Regional	1.5	1.0	1.0	1.0	1.0	1.0	1.8	1.0

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King 03 Regional	2.0	1.5	-	-	1.5	1.0	1.0	1.0
Kern 02 Regional	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.3
Kern 03 Regional	1.0	1.0	-	-	3.5	2.3	-	-
Madera 02 Regional	-	-	1.0	1.0	1.5	1.0	-	-
Madera 03 Regional	1.0	1.0	-	-	3.5	1.8	-	-

Statistical differences in stripe rust resistance

Table 11. Stripe rust resistance scores in flag leaf for individual replications in five locations. Tests were organized in Randomized Complete Block designs with four replications (plot sizes 20 x 5 feet). Assumptions of the ANOVA were tested using Levene's test of homogeneity of variances and Shapiro-Wilk test of normality.

Year	Location	Rep	Kronos	DK	<i>P ANOVA</i>	<i>Levene</i>	<i>Normality</i>
2004	Kern	1	5	1			
2004	Kern	2	4	2			
2004	Kern	3	5	1			
2004	Kern	4	5	2			
2004	Kern	Mean =	4.8	1.5	<i>P ANOVA</i>	<i>Levene</i>	<i>Normality</i>
2004	Kern	SE =	0.3	0.3	0.0065	0.63	0.64
2004	Kings	1	4	1			
2004	Kings	2	4	1			
2004	Kings	3	4	1			
2004	Kings	4	4	1			
2004	Kings	Mean =	4	1	Not testable because variance = 0		
2004	Kings	SE =	0	0			
2005	Kern	1	3	2			
2005	Kern	2	2	1			
2005	Kern	3	4	1			
2005	Kern	4	4	1			
2005	Kern	Mean =	3.3	1.3	<i>P ANOVA</i>	<i>Levene</i>	<i>Normality</i>
2005	Kern	SE =	0.5	0.3	0.03	0.90	0.09
2005	Kings	1	3	1			
2005	Kings	2	2	1			
2005	Kings	3	4	1			
2005	Kings	4	3	1			
2005	Kings	Mean =	3	1	<i>P ANOVA</i>	<i>Levene</i>	<i>Normality</i>
2005	Kings	SE =	0.4	0	0.016	0.13	0.09
2005	Fresno	1	1	1			
2005	Fresno	2	3	1			
2005	Fresno	3	4	1			
2005	Fresno	4	2	1			
2005	Fresno	Mean =	2.5	1	<i>P ANOVA</i>	<i>Levene</i>	<i>Normality</i>
2005	Fresno	SE =	0.6	0	0.103	0.07	0.27

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* Rating scale for stripe rust resistance (% area of flag leaf infected): 1= 0- 3%, 2= 4-14%, 3= 15-29%, 4= 30-49%, 5=50-69%, 6=70-84%, 7= 85-95%, 8=96-100%. Kern 2005 data was transformed to logarithms to obtain homogeneity of variances and Normality of residuals.

Desert King showed significantly higher resistance to stripe rust than Kronos in the four individual ANOVAS performed at Kern and Kings in 2004 and 2005. Desert King was also more resistant to stripe rust than Kronos in the test at Fresno in 2005 but the differences were not significant at this location ($P=0.10$). This provides four independent tests all showing consistent results.

The analysis using the complete model considering environment (year/location) as a random variable and blocks nested within location showed a significant increase in leaf rust resistance in Desert King (average score 1.2= less than 3% of flag leaf infected) relative to Kronos (average score 3.5= 15-30% of flag leaf infected). In this complete model analysis the environment * variety interaction was used as an error term. Even with this stringent criteria of significance the disease scores of Desert King were significantly lower than those of Kronos ($P=0.0004$). For the complete model analysis, data was transformed to logarithms to maintain homogeneity of variances (P Levene's test= 0.22) and normality of residuals (P Shapiro-Wilk test= 0.37). These new results show that during the last two years Kronos has become more susceptible to stripe rust whereas Desert King has remained more resistant.

2) QUALITY

Desert King (DK) has excellent quality equivalent to that of Kronos. Its bushel weight, grain protein content, W alveograph values, firmness, and pasta color are not significantly different from Kronos (Table 12), and its semolina yields are higher than those in Kronos ($P=0.01$).

Table 12. Quality analysis from seed obtained in the Elite, Regional Trials, and Collaborators trials grown in the San Joaquin and Imperial Valley 2002 and 2003.

Bushel wt.		Protein		Alv. W		Color		Firmness	
Kronos	DK	Kronos	DK	Kronos	DK	Kronos	DK	Kronos	DK
61	61	14.19	13.63	201.7	158.1	9	9.5	7.5	9.2
65	63	12.55	12.21	214.2	151.1	10	9.5	6.0	6.7
64	63	13.80	12.88	172.9	143.1	8.5	8.5	6.8	6.2
62	62	13.27	13.97	93.5	123.5	9.0	8.5	7.2	7.8
65	66	12.43	11.45	181.0	133.3	9.0	9.0	6.5	6.0
62	61	13.62	14.09	233.5	144.4	9.0	9.0	6.8	7.8
62.7	63.2	13.31	13.04	182.8	142.3	9.1	9.0	6.8	7.3
Not significant		Not significant		Not significant		Not significant		Not significant	

Table 13. Semolina extraction in percent from five quality tests from 2002 and 2003

Location	Kronos	Desert King	P
UCD 02 Elite	66.1	66.5	
Imp. 02 Elite	64.1	65.3	
Kings 02 Elite	64.9	67.2	
Imp. 02 Regional	62.1	64.1	
Imp. 03 Collaborators	65.0	66.3	
Average	64.4	65.9	$P=0.01$

3. AREA OF ADAPTATION AND PRIMARY USE

Desert King performs well agronomically in all areas where it has been evaluated in California and has good quality characteristics for pasta making. Desert King appears to be well suited for the San Joaquin and Imperial Valley, the main durum producing areas in California. Desert King combines a high yield potential with good pasta qualities and resistance to the major pathogens found in California. Its primary use is for pasta production.

4. PROCEDURE FOR MAINTAINING STOCK SEED CLASSES

The Department of Agronomy and Range Science, UCD will maintain Breeders seed. Foundation seed will be produced and distributed by the Foundation Seed program of the University of California, Davis. The California Crop Improvement Association will provide certification services. New Breeders seed will be produced as needed from head-row progenies obtained from the original Breeders Seed lot. Increases of Foundation Seeds from Foundation seed are allowed for three cycles. After the third cycle, new foundation seed will be produced from the original breeders seed to maintain seed purity.

5. CHARACTERISTICS TO ASSIST FIELD INSPECTORS

The most characteristic aspects of Desert King are its erect leaves, purple color in the auricle region, and its long spikes awns that turn black at maturity.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICEEXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) The Regents of the University of California	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER UC 1375	3. VARIETY NAME 'Desert King'
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) University of California 1111 Franklin Street, 12th Floor Oakland, California 94607-5200	5. TELEPHONE (Include area code) (510) 587-6000	6. FAX (Include area code) (510) 587-6090
7. PVPO NUMBER 200500187		

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain. ☒ YES ☐ NO9. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country. ☒ YES ☐ NO10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES ☐ NO If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

Breeders are employees of applicant/owner.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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